L1(5.1)-Reflecting & Stretching Quadratic Relations

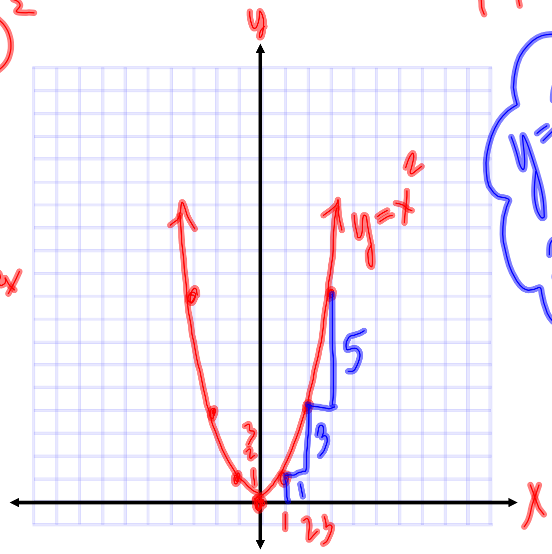
The simplest quadratic relation is $y = x^2$, called the parent function.

1, 3, 5

$y = (-2)^2$

x	$y = x^2$
-2	4
-1	1
0	0
1	1
2	4
3	9

Vertex



$y = 2x^2$

2, 6, 10

May 2-4:13 PM

Compare the graphs and TOV for $y = x^2$, $y = 2x^2$, and $y = \frac{1}{2}x^2$. What do you notice?

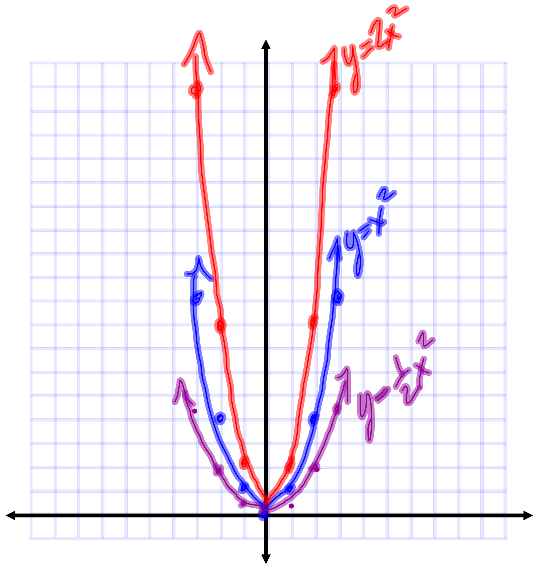
x	$y = x^2$	$y = 2x^2$	$y = \frac{1}{2}x^2$
-3	9	18	4.5
-2	4	8	2
-1	1	2	0.5
0	0	0	0
1	1	2	0.5
2	4	8	2
3	9	18	4.5

Stretch

Compression

May 2-4:18 PM

Graph $y = x^2$, $y = 2x^2$ and $y = \frac{1}{2}x^2$.



1, 3, 5

0.5, 1.5, 2.5

May 2-4:29 PM

$y = x^2$ a = 1, so a > 0, parabola opens up

$y = -x^2$ a = -1, so a < 0, parabola opens down
vertical reflection

The sign of a determines if there is a vertical reflection of the parent function, $y = x^2$.

$y = -x^2$

Nov 8-1:22 PM

When 'a' is a number other than 1 or -1, we say that $y = x^2$ has been vertically scaled.

For a vertical scaling, we only care about the size, or magnitude, of 'a', so we ignore the sign. This is called the "absolute value", and has the symbol $|a|$.

When $|a| > 1$, the graph of $y = x^2$ gets thinner. The parent function undergoes a vertical stretch.

e.g.,

When $0 < |a| < 1$, the graph of $y = x^2$ gets wider. The parent function undergoes a vertical compression.

e.g.,

May 2-4:31 PM

Ex.1. Describe the transformations to $y = x^2$ that yield the following:

(a) $y = \frac{1}{4}x^2$

Vertical compression by a factor of 1/4

(b) $y = -3x^2$

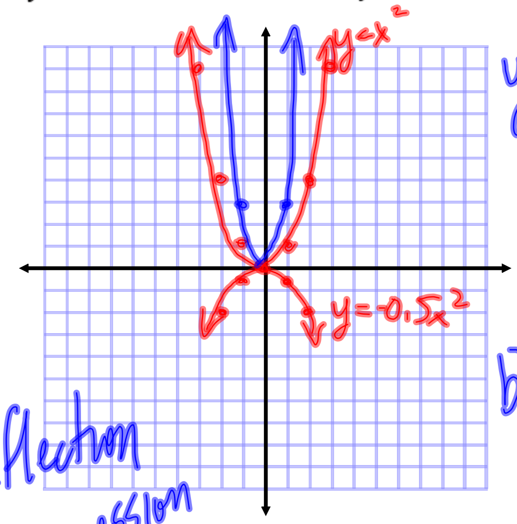
- vertical reflection in the x axis
- vertical stretch by a factor of 3

May 2-4:35 PM

Ex. 2. Graph (a) $y = -0.5x^2$ (b) $y = 3x^2$

$y=a(x-h)^2+k$

x	$y=x^2$



a) Vertical reflection
Vertical compression
by a factor of 0.5

b) Vertical
stretch by
a factor
of 3

Apr 11-8:49 PM

Assigned Work:

p. 256 # 1, 2, 4 ,5 ,8

Mar 20 - 4:57 PM

Nov 10-8:07 AM